WHAT IS CLAIMED IS:

1. A method of transmitting data from a plurality of mobile stations to a base station, the method comprising:

dividing the plurality of mobile stations into a first and a second group, the first group comprising a first set of mobile stations using a first set of time average data rates and the second group comprising a second set of mobile stations using a second set of time average date rates, wherein the first set of time average data rates is higher than the second set of time average data rates; and

transmitting data from the first set of mobile stations at a higher time average data rate than data transmitted from the second set of mobile stations.

2. The method of Claim 1, wherein the first set of mobile stations transmit at a lower power than the second set of mobile stations.

3. The method of Claim 1, wherein the plurality of mobile stations only transmit one at a time.

4. The method of Claim 1, wherein the first set of mobile stations transmit more often than the second set of mobile stations.

5. The method of Claim 1, wherein the plurality of mobile stations transmit at their maximum allowable instantaneous data rate.

6. A method of transmitting data from a plurality of mobile stations to a base station, the method comprising:

dividing the mobile stations into a first and a second data rate group;

selecting a first mobile station for transmission, the first mobile station being the first one in a data queue and in the first data rate group;

calculating first cross correlations between array response vectors of the first mobile station and the rest of the mobile stations in the first data rate group;

comparing the first cross correlations to a predetermined threshold;

selecting a second mobile station unless all the first cross correlations are greater than or equal to the predetermined threshold and all second cross correlations between array response vectors of the first mobile station and mobile stations in the second data rate group are greater than or equal to the predetermined threshold; and

transmitting data from said selected mobile stations simultaneously.

7. The method of Claim 6, wherein the second mobile station has an associated one of the first cross correlations that is the lowest of the first cross correlations if at least one of the first cross correlations is less than the predetermined threshold.

8. The method of Claim 6, wherein the second mobile station has an associated one of the second cross correlations that is the lowest of the second cross correlations if there are no first cross correlations less than the predetermined threshold and if at least one of the second cross correlations is less than the predetermined threshold.

9. The method of Claim 6, further comprising determining whether a third mobile station is selected, wherein the determining comprises:

calculating third cross correlations between array response vectors of the second mobile station and mobile stations in the second data rate group;

calculating fourth cross correlations between array response vectors of the first mobile station and mobile stations in the second data rate group;

determining if any mobile station in the second data rate group has associated therewith cross correlations with respect to the first mobile station and the second mobile station below the predetermined threshold;

summing the cross correlations with respect to the first mobile station and the second mobile station with any mobile station of the second data rate group determined to be below the predetermined threshold;

selecting as the third mobile station a mobile station having a smallest sum of cross correlations with respect to the first mobile station and the second mobile station.

10. The method of Claim 6, further comprising determining whether a third mobile station is selected, wherein the determining comprises:

calculating third cross correlations between array response vectors of the second mobile station and mobile stations in the first data rate group that have cross correlations less than the predetermined threshold; and

selecting the third mobile station if at least one of the first and at least one of the third cross correlations are less than the predetermined threshold, the third mobile station having an associated one of the third cross correlations that is the lowest of the third cross correlations.

11. The method of Claim 6, further comprising determining whether a third mobile station is selected, wherein the determining comprises:

calculating third cross correlations between array response vectors of the second mobile station and mobile stations in the second data rate group that have cross correlations less than the predetermined threshold; and

selecting the third mobile station if at least one of the second and at least one of the third cross correlations are less than the predetermined threshold, the third mobile station having an associated one of the third cross correlations that is the lowest of the third cross correlations.

12. A method of transmitting data from a plurality of mobile stations to a base station, the method comprising:

selecting a first mobile station, the first mobile station being first in a data queue;

calculating cross correlations of array response vectors of the first mobile station and array response vectors of other selected mobile stations;

selecting one or more of the mobile stations based on mobile stations having cross correlations less than a predetermined threshold; and

transmitting simultaneously the selected mobile stations during a next data packet duration.

13. The method of Claim 12, wherein the transmission is the maximum instantaneous data rate of the selected mobile stations.

14. A method of transmitting data from a plurality of mobile stations to a base station, the method comprising:

selecting a first mobile station, the first mobile station being first in a data queue;

calculating first cross correlations of array response vectors of the first mobile station with array response vectors of the other mobile stations;

comparing the first cross correlations with a predetermined threshold;

determining a number of first cross correlations less than the predetermined threshold;

selecting additional mobile stations based on the number of cross correlations from a first group of mobile stations corresponding to the first cross correlations less than the threshold; and

transmitting data from the selected mobile stations simultaneously during a next time slot.

15. The method of Claim 14, wherein the number is zero, one, or greater than one.

16. The method of Claim 15, wherein the selecting additional mobile stations comprises:

selecting no additional mobile stations if the number is zero;

selecting a second mobile station if the number is one; and

selecting a second and possibly a third mobile station if the number is greater than one.

17. The method of Claim 16, wherein if the number is one, the second mobile station is the other mobile station in the first group.

18. The method of Claim 16, wherein if the number is greater than one, selecting the second and possibly the third mobile station comprises:

calculating second cross correlations between all mobile stations in the first group;

selecting only the second mobile station if no second cross correlations are less than the predetermined threshold; and

selecting the second and third mobile stations from a second group of mobile stations corresponding to second cross correlations less than the predetermined threshold if at least one of the second cross correlations is less than the threshold.

19. The method of Claim 18, wherein if no second cross correlations are less than the predetermined threshold, the second mobile station is the mobile station in the first group having the lowest transmitting power.

20. The method of Claim 18, wherein if at least one of the second cross correlations is less than the threshold, the second and third mobile stations are the pair of mobile stations in the second group having the lowest combined average transmitting powers.

21. A method of selecting from N mobile stations each having an associated measured response vector V, K groups of L mobile stations for each of K communication slots of a wireless communication system, the method comprising:

(a) determining a list of J mobile stations from the N mobile stations depending on the frequency of desired selection for each of the N mobile stations;

(b) selecting L mobile stations from the list;

(c) calculating a value of a function F of the response vectors V for the L mobile stations;

(d) determining whether the value is less than a predetermined threshold;

(e) repeating steps (b)-(d) if the value is greater than or equal to the predetermined threshold a maximum of M successive times;

(f) selecting the L mobile stations if the value is less the predetermined threshold or selecting from the M groups, the group of L mobile stations having the smallest value if none of the values is less than the predetermined threshold;

(g) removing the selected mobile stations from the list; and

(h) repeating steps (b)-(g) K-1 times.

22. The method of Claim 21, wherein the function F is represented by the equation:

$$F = 1/2\sum_{i,j=1}^{L}\left|V_i * V_j\right|^2 * (1-\delta_{ij}),$$

wherein || is the complex modulus function.

23. The method of Claim 21, wherein determining the list comprises mobile stations that have a higher desired frequency of selection a higher number of times than mobile stations that have a lower desired frequency of selection.

24. A system for providing high data rate wireless communication, said system comprising:

scheduler circuitry having a mobile station communication control algorithm, wherein said scheduler circuitry identifies mobile stations of a plurality of mobile stations as of a higher time average data rate mobile station group and other mobile stations of said plurality of mobile stations as of a lower time average data rate mobile station group, and wherein said scheduler circuitry operates to schedule communications with respect to said plurality of mobile stations such that mobile stations of said higher time average data rate group are scheduled for communication more often than mobile stations of said lower time average data rate group.

25. The system of claim 24, wherein said mobile stations of said higher time average data rate group and said mobile stations of said lower time average data rate group communicate at a maximum instantaneous data rate during said communications scheduled by said scheduler circuitry.

26. The system of claim 24, wherein mobile stations of said higher time average data rate group and mobile stations of said lower time average data rate group are identified with each such corresponding group by said scheduler circuitry as a function of a transmit power level associated therewith.

27. The system of claim 26, wherein identification of particular mobile stations with one of said higher time average data rate group and said lower time average data rate group is a function of a lowest average power level with respect to a total number of mobile stations communicating.

28. The system of claim 27, wherein said average power level (AP) is represented by the equation:

$$AP = \frac{N \cdot \sum_{k=1}^{J} P_k + \sum_{k=J+1}^{K} P_k}{(N-1) \cdot J + K},$$

wherein N is a factor by which a data rate of said higher time average data rate group is to exceed a data rate of said lower time average data rate group, K is a number of mobile stations of said plurality of mobile stations for which communications are desired, J is a number between 1 and K inclusive, and P_k is the power level for the k^{th} mobile station required to communicate a highest instantaneous data rate.

29. The system of claim 24, further comprising:

cross correlation circuitry receiving signals from an antenna array in communication with mobile stations of said plurality of mobile stations, wherein said cross correlation circuitry determines an array response vector for mobile stations of said plurality of mobile stations and cross correlates the array response vectors of mobile stations of said plurality of mobile stations to thereby provide cross correlation information to said scheduler circuitry for use in said scheduling communications with respect to said plurality of mobile stations.

30. The system of claim 29, further comprising:

a communication queue coupled to said scheduler circuitry, wherein mobile stations of said plurality of mobile stations are represented in said queue a number of times approximately equal to a factor by which a data rate of said higher time average data rate group is to exceed a data rate of said lower time average data rate group, wherein said scheduler operates to schedule communications with respect to said plurality of mobile stations through selection of particular mobile stations from said queue.

31. The system of claim 30, wherein said scheduler circuitry selects a first mobile station from said queue for communication during a subsequent time interval and attempts to identify another mobile station from said queue having a same time average data rate group affiliation as said first mobile station for communication during said subsequent time interval, wherein said identification of another mobile station is a function of said cross correlation information.

32. The system of claim 31, wherein said function of said cross correlation information is a cross correlation below a predetermined threshold cross correlation.

33. The system of claim 31, wherein said scheduler circuitry attempts to identify another mobile station from said queue having a different time average data rate group affiliation than said first mobile station for communication during said subsequent time interval if said function of said cross correlation information did not identify a mobile station from said queue having a same time average data rate group affiliation as said first mobile station.

34. The system of claim 29, wherein said scheduler circuitry selects a first mobile station from said queue for communication during a subsequent time interval and attempts to identify another mobile station from said queue for communication during said subsequent time interval, wherein said identification of another mobile station is a function of said cross correlation information.

35. The system of claim 34, wherein said scheduler circuitry identifies all mobile stations in said queue having a cross correlation with respect to said first mobile station below a predetermined threshold, if there is only one mobile station having a cross correlation with respect to the first mobile station less than a predetermined threshold this mobile station is selected as a second mobile station for communication during said subsequent time interval, if there is more than one mobile station having a cross correlation with respect to the first mobile station less than a predetermined threshold the cross correlations for each such mobile station are analyzed to determine if there is any pair of such mobile stations having cross correlations with respect to one another less than said predetermined threshold.

36. The system of claim 29, wherein said scheduler circuitry selects a predetermined number of mobile stations from said queue as candidates for simultaneous communication and performs a cost analysis with respect to simultaneous communication therewith.

37. The system of claim 36, wherein if a cost value from said cost analysis is below a predetermined threshold said selected mobile stations are scheduled for communication during a same subsequent time interval, and wherein if said cost value from said cost analysis is above said predetermined threshold said scheduler circuitry again selects said predetermined number of mobile stations from said queue.

38. The system of claim 36, wherein selection of said mobile stations from said queue is substantially random.

39. The system of claim 36, wherein said predetermined number is three.

40. The system of claim 36, wherein said cost analysis is accomplished at least in part through the equation:

$$\text{cost} = | V(n1)' * V(n2) |^2 + | V(n2)' * V(n3) |^2 + | V(n1)' * V(n3) |^2 \quad (3)$$

wherein n1, n2, and n3 are index numbers of the selected mobile stations, V is an array response vector for an associated mobile station, | | is a complex modulus function, and ' is a complex conjugate transpose function.